Report Language, Methods, and Limitations

Table of Contents

Report Language, Methods, and Limitations

1 INTRODUCTION

This document establishes the required language for use in *Laboratory Reports* and *i3 products*, except when warranted by specific circumstances, specific to the Firearms/Toolmarks Discipline (FTD). The FTD is composed of personnel from the Firearms/Toolmarks Unit (FTU) and the Scientific & Biometrics Analysis Unit – Toolmark Group (SBAU-TG).

2 SCOPE

This document applies to FTD personnel who are authorized to issue *Laboratory Reports* and *i3 products*.

3 RESULTS OF EXAMINATION, METHODS, AND LIMITATIONS

If an examination is performed and a methods and limitations statement does not exist, the FTD personnel will confer with the FTD Technical Leader.

3.1 Accidental Discharge

Result:

- [#] is a 20 gauge Jing An (China) shotgun, Model SPM-20, Serial Number [#]. The [#] shotgun functioned normally when tested in the Laboratory and could not be made to fire without a pull of the trigger.
- [#] is a 20 gauge Jing An (China) shotgun, Model SPM-20, Serial Number [#]. During testing in the Laboratory, the [#] shotgun could be made to fire without a pull of the trigger.

Methods:

An accidental discharge test is conducted in all modes of fire for a firearm, utilizing a primed cartridge case or shotshell case. The firearm is struck with a rawhide or similar styled mallet on its six planes: front of muzzle, butt plate, top of breech and chamber, bottom of trigger guard and frame and both sides of the receiver/frame. If necessary, tests can be undertaken in order to attempt to duplicate the conditions under which the firearm discharged.

Limitations:

When an accidental discharge examination is performed, it may not be possible to recreate or duplicate all of the circumstances which led to the discharge of a firearm without a pull of the trigger.

3.2 Physical and Visual Examination

3.2.1 Ammunition/General

Results:

- [#] consists of [number] [caliber] cartridges that [are loaded with bullet type and] bear the headstamp of [name] ammunition and are physically consistent with functional ammunition.
- [#] consists of [number] [caliber] cartridges that bear the headstamp of [name] ammunition and is physically consistent with functional ammunition.
- [#] is a [caliber] cartridge that is physically consistent with functional ammunition.
- The [#] is labeled with the trade names "[name]" and "[name]" and contains fifteen 9mm Luger (9x19mm) cartridges, all of which bear the headstamp of [name] and have design characteristics that are physically consistent with functional ammunition sold under these trade names. [#] are 9mm Luger (9x19mm) cartridges that also bear the headstamp of [name]. [#] are physically consistent with functional ammunition and bear all of the same observable design characteristics as the cartridges in the [#] box; however, there is no method of determining whether or not the [#] originated in the [#] box.
- Due to the agreement of class characteristics and the presence and alignment of similar post-manufacture features, Item [ ] and Item [ ] are physically consistent with having been part of the same object. However, due to a lack of suitable fractured surfaces, it could not be determined if the items were joined at one time.
- Item [#] and Item [#] are physically consistent with one another with respect to [list observed properties of the two items that are consistent].
- Item [#] [piece of metal] is physically consistent with [type of metal]. This determination is made based on the appearance and magnetic properties of Item [#] and is not the result of chemical or metallurgical testing. If additional information is desired as to the composition of Item [#], a metallurgical examination should be requested.
- Item [#] is physically consistent with the [object/tool] sold under the [distributor/manufacturer name] trade name.
- Item [#] is physically consistent in regard to [list observed properties] as [product name] found at supply stores such as [list store names].

Methods:

Physical and visual evaluations compare the physical and class characteristics of evidence items. A conclusion of “physically consistent with” is reached if the observable or measurable physical dimensions and/or design features of two items are in agreement or are "physically consistent." If these dimensions and features are clearly different, an elimination conclusion is reached. If there is a lack of observable design features or measurable dimensions, the result is inconclusive.

Limitations:

A Physical and Visual Evaluation examination is unsuitable for determining a source identification conclusion. A conclusion of "physically consistent with" signifies a restricted group source, based on class characteristics and/or observable features, from which evidence may have originated. Post-manufacture features cannot be used for elimination purposes.

3.2.2 Electronic Evidence

Results:

- [#] is a compact disc that contains bank surveillance photographs. An object depicted in image 180211.tif, is consistent with a dark colored pistol. An object depicted in image 180155.tif, is consistent with a silver-colored revolver. Due to inadequate image quality, no further information could be obtained from the images from the [#] compact disc.
- The object depicted in the [#] physically consistent with the [model(s)] pistols/revolvers/rifles/shotguns manufactured by [name].

Methods:

The physical characteristics of an unknown object depicted in a photograph and/or electronic media are compared to known reference materials to determine if there are any consistencies.

Limitations:

Due to poor image quality or a lack of observable physical characteristics, it may not be possible to determine if an object depicted in a photograph is a functional firearm, a replica firearm, or a toy firearm. Examinations of electronic evidence may be impacted by data quality and size of the item(s) in question.

3.3 Barrel & Overall Length Measurement

Results:

- The barrel of the [#] rifle was examined and determined to have been shortened to a length of [0.00] inches (+/- [0.00] inches, k=3 for a 99.73% confidence level).
- The overall length of the [#] shotgun is [0.00] inches (+/- [0.00] inches k=3 for a 99.73% confidence level).
- Examination of the [#] rifle determined that the barrel had been shortened making the overall length [0.00] inches (+/- [0.00] inches k=3 for a 99.73% confidence level).

Methods:

Barrel length is measured using a ruler or measuring rod and overall length of a firearm is measured using a measuring platform with a ruler. The rulers and measuring rods are traceable to a National Institute of Standards and Technology (NIST) standard.

Limitations:

The accuracy of barrel length and overall length measurements are limited by the straightness of the measuring device, the ability to delineate the furthest point of a barrel in relation to the

measuring device, proper alignment of the firearm in the measuring platform, environmental conditions, and the measuring ability of the person making the measurement.

3.4 Bullet Testing Kit

Results:

- A presumptive chemical test for the presence of lead and copper was performed on [#]. The test was positive for both lead and copper.
- A presumptive chemical test for the presence of lead and copper was performed on [#]. The test was negative for both lead and copper.
- A presumptive chemical test for the presence of lead and copper was performed on [#]. The test was [positive/negative] for lead and [positive/negative] copper.

Methods:

Suspected bullet impacts or holes are examined visually and/or microscopically for the presence of physical effects that might have been produced by a bullet. If these conditions are noted, a series of presumptive chemical tests for the presence of lead and copper may be performed. Each of these tests is chemically specific and produces a colored reaction when in the presence of the specific chemical.

Limitations:

Presumptive chemical tests are not conclusive and are meant to provide additional information regarding the possibility of a bullet impact or passage. The presumptive test does not distinguish whether lead and copper are deposited by a bullet or by another source.

3.5 Ejection Pattern

Results:

- Ejected cartridge cases from the [#] pistol were found to strike the ground [0.00] feet (+/- [0.00] ft., k=3 for a 99.73% confidence level) to the right and [0.00] feet (+/- [0.00] ft., k=3 for a 99.73% confidence level) to the front of the [#] ejection port.

Methods:

The floor/ground is marked with two intersecting lines that form a coordinate axis. The firearm is fired from a position directly above the origin. The point of each cartridge case's first impact with the floor/ground is marked for each shot that is fired. When the test firing has concluded, all of the markers are measured for their position from the axis. These measurements are used to calculate an average point of impact on both axes as well as the uncertainty.

Limitations:

Several conditions (orientation of the firearm when fired, walls or intervening objects, floor or ground surface variability, inadvertent movement of cartridge cases by first responders) may affect the final location of fired cartridge cases at a shooting scene. The test results are only valid for the firearm tested along with the magazine and type of ammunition used.

3.6 eTrace

Results:

- An eTrace request was submitted using the serial number from the [#] [type] and the results can be found under the Trace number [#].

Methods:

The make, model, serial number from a firearm, to include other investigative information, is submitted to the Department of Justice electronic tracing system (eTrace) internet-based database. Firearm tracing can provide systematic tracking information of a recovered firearm from its manufacturer or importer to its point(s) of purchase and recovery.

Limitations:

The eTrace database will only return a firearms trace report if the information about the recovered firearm is available.

3.7 Firearms Function

Results:

- Item [#] is a .223 Remington caliber Colt rifle, Model [#], which functioned normally when tested in the Laboratory with the submitted magazine.
- Item [#] is a 9x19mm Glock pistol, Model [#], which functioned normally when tested in the Laboratory using the [#] magazine.
- Item [#] is a .357 Magnum caliber Smith & Wesson revolver, Model [#], which functioned normally when tested in the Laboratory.
- [#] is a .40 S&W caliber Hi-Point pistol, Model JCP, which functioned normally when tested in the Laboratory using a magazine from the Reference Firearms Collection.
- Item [#] is a .40 S&W caliber pistol using a [Manufacturer e.g., Polymer 80] frame, Model [#], and a Glock 22 slide and barrel. The frame is consistent with unfinished or "80%" frame commercially produced by the [Manufacturer e.g., Polymer 80 Company] and are manufactured without a serial number.
- Item [#] is a [caliber] "80 %" rifle, which functioned normally when tested in the Laboratory with the submitted magazine. Examination of the Item [#] rifle determined the upper receiver was manufactured by [Manufacturer e.g., Del-Ton Inc.] located in [city, state] and the lower receiver was manufactured by [Manufacturer i.e., Polymer 80] Model [#] located in [city, state]. The "80%" refers to an item that has not reached a stage of manufacture that meets the definition of a firearm frame or receiver and is designed to be completed by the purchaser. Additionally, "80%" lower receivers, such as the one on the Item [#] rifle, are not serialized.

Methods:

The make, model, and caliber of a firearm are normally determined by directly observing manufacturer markings on the firearm in question. When these are not present, published materials and firearms in the Laboratory's Reference Firearms Collection may be used to make determinations. Unless otherwise noted, submitted firearms are test fired: in the condition

they are received in the Firearms/Toolmarks Unit; with ammunition from the Laboratory's Reference Ammunition File; and in a manner that allows for testing of available modes of fire such as manual safety engaged, manual safety disengaged, single action, double action, semi-automatic, fully automatic, etc.

Limitations:

The results of firearms function examinations describe the operating condition of the firearm as received in the Firearms/Toolmarks Unit.

3.8 Fracture Examination

Results:

- Through a fracture examination utilizing comparative microscopy, it was determined that the Item [#] piece of hasp and the Item [#] piece of hasp were once joined.
- Through a fracture examination utilizing physical fit evaluation, it was determined that the Item [#] piece of hasp and the Item [#] piece of hasp were once joined.
- A fracture fit examination of the [#] piece of screwdriver and [#] was inconclusive due to insufficient quality and/or quantity of observed characteristics to determine whether two or more fractured items could have originated from the same object.
- Fracture fit examinations among the [Items # through # (Laboratory Number)] and the [Items # through # (Laboratory Number)] pieces of screwdriver were inconclusive due to insufficient quality and/or quantity of observed characteristics to determine whether two or more fractured items could have originated from the same object.
- A physical fit examination of the [#] piece of screwdriver and [#] was inconclusive due to insufficient quality and/or quantity of observed characteristics to determine whether two or more fractured items could have originated from the same object.
- Physical fit examinations among the [Items # through # (Laboratory Number)] and the [Items # through # (Laboratory Number)] pieces of screwdriver were inconclusive due to insufficient quality and/or quantity of observed characteristics to determine whether two or more fractured items could have originated from the same object.
- Due to a difference in the class characteristics [e.g., size and shape] of the material, the Item [#] piece of screwdriver and the Item [#] screwdriver were excluded as having been joined at one time.
- Through fracture examination, utilizing physical fit evaluation, it was determined that the Item [#] piece of hasp and Item [#] piece of hasp were not originally connected due to a difference in class characteristics.

Methods:

Fracture examinations undergo two stages of comparison. First, the fractured items are examined to determine and compare their class characteristics. The class characteristics of marks on fractured items include, but are not limited to, the shape and size of the material. If the class characteristics of the fractured items are not clearly different, the examination moves

to a second stage where the fractured items are examined utilizing physical fit evaluation and/or comparative microscopy to determine if the fractured items were joined at one time.

The comparison examination consists of an evaluation of the fracture marks/contours present in two items to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued:

A. Exclusion is an Examiner's conclusion that two or more fractured items do not physically fit together. The basis for an 'exclusion' conclusion is an Examiner's opinion that the observed class characteristics and/or corresponding individual characteristics of the two or more fractured items provide extremely strong support for the proposition that the fractured items do not physically fit together and extremely weak or no support for the proposition that the fractured items physically fit together.
B. Fracture Fit is an Examiner's conclusion that two or more fractured items were once part of the same object. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics for the fractures is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another object and insufficient disagreement in corresponding individual characteristics to conclude they originated from different objects. This conclusion can only be reached when two or more fractured items physically fit together or when a comparison of the corresponding surfaces of the fractured items reveals a fit. The basis for a fracture fit conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics of the two or more fractured items provide extremely strong support for the proposition that they were once part of the same object and extremely weak support for the proposition that the fractured items originated from different objects. Before being reported, a fracture fit conclusion requires a verification to be completed.
C. Inconclusive is an Examiner's conclusion that no determination can be reached as to whether two or more fractured items could have originated from the same object. The basis for an inconclusive conclusion is an Examiner's opinion that there is an insufficient quantity and/or quality of observed characteristics to determine whether two or more fractured items could have originated from the same object. Reasons for an inconclusive conclusion include the presence of physical or microscopic similarity that is insufficient to form the conclusion of fracture fit; a lack of any observed similarity; or physical or microscopic dissimilarity that is insufficient to form the conclusion of exclusion.

Limitations:

Fracture Examination is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to corrosion and abuse, fracture/contour marks created from the fracture of an object are not always identifiable as such.

3.9 General Rifling Characteristics

Results:

- [#] is a .40 caliber/10mm [bullet type] that was fired from a barrel rifled with six grooves, right twist. A check of the FBI Laboratory's General Rifling Characteristics (GRC) database produced a list of [firearm type] with GRCs like those present on the [#] that includes pistols marketed by [manufacturer] and revolvers marketed by [manufacturer].

Methods:

The appropriate GRC measurements are entered in the database, which then returns a list of all firearms in the database with compatible GRCs.

Limitations:

The GRC database contains information obtained from firearms at the FBI Laboratory and from voluntary submissions of test-fired specimens from law enforcement agencies around the world. It is not a comprehensive list of all firearms and contains no information about the numbers of each type of firearm present in the general population. The firearms listed in the report are typically those considered to be more common and are included at the discretion of the examiner authoring the report.

3.10 Distance Determination Examination

3.10.1 Gunshot Residue

Results:

- The [#] shirt was microscopically examined and chemically processed for gunshot residues, and none were found.
- The [#] shirt was microscopically examined and chemically processed for gunshot residues. Lead and/or copper residues consistent with the passage of a bullet were found surrounding a hole below the right front pocket of the shirt. No other residues were detected.
- The [#] shirt was microscopically examined and chemically processed for gunshot residues. Particulate lead and/or copper residues consistent with the discharge of a firearm were found on the collar of the shirt, but these residues are unsuitable for muzzle-to-target distance determinations. No other residues were detected.
- The [#] shirt was microscopically examined and chemically processed for gunshot residues. Nitrite residues were found near a hole below the right front pocket of the shirt, but a muzzle-to-target range could not be determined due to the lack of a measurable pattern of deposition. However, during testing of the [#] pistol and the [#] through [#] cartridges in the Laboratory, nitrite residues were only deposited at a muzzle-to-target distance of less than five feet. No other residues were detected.
- The [#] shirt was microscopically examined and chemically processed for gunshot residues. Nitrite residues were found near a hole below the right front pocket of the shirt, but a muzzle-to-target range could not be determined due to the lack of a

measurable pattern of deposition. Please note that residues like those found on the [#] shirt are rarely deposited at a distance of six feet or greater. No other residues were detected.

- The [#] shirt was microscopically examined and chemically processed for gunshot residues. Nitrite and vaporous lead and/or copper residues were found near a hole below the right front pocket of the shirt. These residues were compared to residues present on test-fired exemplars produced using the submitted firearm and ammunition at a variety of muzzle-to-target distances. The residues present on the [#] shirt could only be duplicated at a distance of twenty-four inches or less. No other residues were detected.
- The [#] shirt was microscopically examined and chemically processed for gunshot residues, and vaporous lead and/or copper residue deposits were found. Although a muzzle-to target distance could not be determined, it should be noted that residues like those found on the [#] shirt are rarely deposited at a distance of twenty-four inches or greater. No other residues were detected.
- The area around the hole in the [#] shirt was microscopically examined and chemically processed for the presence of gunshot residues, and a pattern of Nitrite and lead/copper residues was found. The pattern of residues present on the [#] shirt was reproduced at a muzzle-to-target range of greater than eight and less than sixteen inches when using the submitted [#] pistol and [#] through [#] cartridges. No other residues were detected.
- The area around the hole in the [#] shirt was microscopically examined and chemically processed for gunshot residues, and Nitrite/lead/copper residues were found these residues and physical effects are consistent with the muzzle of the firearm being in contact or near contact with the [#] shirt.

Methods:

Items submitted for gunshot residue testing are examined visually and microscopically for the presence of suspected bullet holes, physical effects from a firearm discharge such as singeing or tearing of fabric, and embedded particles of gunpowder, lead, and copper. If some or all these conditions are noted, a series of chemical tests for the presence of nitrites (a component of gunpowder), lead, and copper may be performed. Each of these tests are chemically specific and produce a color reaction when in the presence of the specific chemical. The tests used for nitrite compounds, lead, and copper are the Modified Griess Test, the Sodium Rhodizonate Test, and the Dithiooxamide Test, respectively.

If a suspect firearm and ammunition are submitted, test-fired exemplars are created at a variety of muzzle-to-target distances, are visually examined and chemically processed in the same manner as the evidence, and are compared directly with the submitted evidence. When test results at specific distances are distinctly different than the results on the submitted evidence, this is used as the basis for excluding an appropriate range of distances ("could not be reproduced at a distance of four inches or less").

When no suspect firearm and/or ammunition is submitted, results are more general and are based on common maximum distances for the deposition of gunshot residues ("residues like those found on the [Item #] are rarely deposited at a distance of six feet or greater").

If the only reaction produced in testing is a small ring of lead and/or copper around a suspected bullet hole, this is considered consistent with the passage of a bullet, but no distance determination can be made.

Limitations:

While firearms are known to produce consistent gunshot residue pattern results under controlled conditions, variables including shooting environment, barrel condition and ammunition design can all influence the results of tests conducted on the submitted evidence and test-fired exemplars. Accordingly, gunshot residue test results are primarily used to exclude particular muzzle-to-target ranges and should only be considered valid for the particular combination of firearm and ammunition type used during testing in the Laboratory. The use of the phrase "consistent with" in this report is meant to indicate physical effects that are commonly found in a given shooting environment. No conclusions can be drawn when residues are absent due to the possibility of intervening objects or environmental and handling conditions. When a bullet impacts an intervening object, vaporous lead residue deposits can be produced that are occasionally dispersed onto neighboring items. Distance determinations involving a wound and/or injury are outside the scope of this procedure.

3.10.2 Shot Pattern

Results:

- The [#] metal panel bears a pattern of nine distinct impact marks that is typical of damage created by buckshot pellets. The pattern of impact marks present on the [#] metal panel was reproduced at a muzzle-to-target range of greater than twenty-four feet and less than thirty-two feet when using the submitted [#] shotgun and the [#] through [#] shotshells.

Methods:

Items submitted for shot pattern testing are initially examined for physical effects consistent with the discharge of shot pellets. If these effects are found and a suspect firearm and shotshells have been submitted, test-fired exemplars are created at a variety of muzzle-to-target distances. These test patterns are compared directly with the pattern present on the submitted evidence. When the test patterns at specific distances are distinctly different than the pattern on the submitted evidence, this is used as the basis for excluding an appropriate range of distances.

Limitations:

While shotguns are known to produce consistent shot pattern results under controlled conditions, variables including barrel length, barrel choke and shotshell design can all influence the size and distribution of shot patterns present on the submitted evidence and test-fired exemplars. Accordingly, shot pattern test results are primarily used to exclude particular muzzle-to-target ranges and should only be considered valid for the particular combination of shotgun and type of shotshell used during testing in the Laboratory. Distance determinations involving a wound and/or injury are outside the scope of this procedure.

3.11 Laminate Glass Examination

Results:

- Group [#]: Due to radial crack intersection, it was determined that Hole [#] occurred before Holes [#], the sequence for Holes [#] had no associations.
- Group [#]: Due to interference and conflicting intersecting fractures, a sequence between Hole [#] and Hole [#] could not be determined.
- Hole [#] occurred before Hole [#] due to a radial crack intersection.

Methods:

Laminate Glass Examination - Laminate glass is a type of safety glass designed to remain intact when impacted or perforated. The glass is constructed using two or more plates of glass bonded to an inner layer of polyvinyl. When shattered, the glass cracks producing radial and concentric fractures from the origin of impact or perforation. Both radial and concentric fractures can occur on a single or several layers of laminate glass from one projectile. Laminate glass examination for shot sequence requires a physical and/or visual evaluation of the radial fractures from the location of intersections. When a radial fracture encounters a preexisting radial fracture, it is prevented from propagating due to the preexisting fissure. This intersection indicates the shot sequence with the preexisting fracture occurring before the intersecting fracture.

Laminate Glass Examination for Direction - Glass examination for directionality requires a physical and/or visual evaluation of the perforation for a fracture cone. The fracture cone is a tapered contour created around the exit side of the perforation.

Limitations:

Laminate Glass Examination Shot Sequence - Fractures can continue to propagate after an impact or perforation due to changes in temperature and/or stress from the movement of laminate glass. This can result in a fracture intersection which is not a result of shot sequence. Due to proximity of impacts or perforations, intersecting fractures may not be readily apparent.

Laminate Glass Examination - Due to the proximity of perforations or impacts, the contour for the fracture cone may be readily apparent.

3.12 NIBIN

Results:

- Images of a test-fired specimen from the [Item # firearm type] were entered into the National Integrated Ballistic Information Network (NIBIN) and searched within the zone(s) that includes [state]. No associations were found at this time.
- Images of a test-fired specimen from the [Item # firearm type] were entered into the National Integrated Ballistic Information Network (NIBIN) and searched within the zone(s) that includes [state]. An image of a cartridge case from the [Item # firearm type] is similar to an image that was entered in connection with [originating agency, case number]. This evidence needs to be submitted to the Laboratory for a direct comparison to determine if an association exists with the [Item # firearm type].

- Images of the [Item # cartridge case] were entered into the National Integrated Ballistic Information Network (NIBIN) and searched within the zone(s) that includes [state]. No associations were found at this time.
- Images of the [Item # cartridge case] were entered into the National Integrated Ballistic Information Network (NIBIN) and searched within the zone(s) that includes [state]. An image of the [Item # cartridge case] is similar to an image that was entered in connection with [originating agency, case number]. This evidence needs to be submitted to the Laboratory for a direct comparison to determine if an association exists with the [Item # cartridge case].
- A National Integrated Ballistic Information Network (NIBIN) search was not conducted due to revolver-type cartridge case images not being entered into the database.
- A National Integrated Ballistic Information Network (NIBIN) search was not conducted due to bullet images not being entered into the database.
- A National Integrated Ballistic Information Network (NIBIN) search was not conducted due to [caliber] cartridge cases not normally being entered into the database.

Methods:

When a NIBIN entry is performed for a submitted firearm, an image of a test-fired cartridge case from that firearm is entered in the NIBIN database. An image of a representative sample of any submitted cartridge cases that have not been associated with a specific firearm are also entered in the NIBIN system. Entries are searched against the appropriate regional database(s), and correlation results are viewed to determine possible associations.

Limitations:

Due to a number of variables regarding image capture and data entry, NIBIN searches may not always locate entries that were fired in the same firearm. Additionally, the algorithm used in NIBIN merely provides a sorting capability for potentially associated toolmarks represented on cartridge cases and provides no statistical confidence in possible matching results.

3.13 Pattern Examination

Results:

- The [#] bullet was identified as having been fired from the barrel of the [#] pistol.
- The [#] cartridge case was identified as having been fired in the [#] pistol.
- Toolmarks present on the [#] hasp were identified as having been produced by the [#] bolt cutters.
- Toolmarks present on the [#] and [#] bearing balls were identified as having been produced by the same tool.
- [#] through [#] are drill bits bearing a symbol associated with the trade name Vermont American. The [#] drill bit was identified as having created the toolmarks present on the [#] padlock.
- A pattern examination of the Item [#} bullet and Item [#] pistol was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.

- A pattern examination of the Item [#} cartridge case and Item [#] pistol was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.
- A pattern examination of toolmarks present on the Item [#} padlock and [#] drill bit was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.
- A pattern examination of toolmarks present on the Item [#} and Item [#] was inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.
- Pattern examinations among the [Items # through # (Laboratory Number)] and the [Items # through # (Laboratory Number)] were inconclusive due to insufficient quality and/or quantity of corresponding individual characteristics.
- The [#] bullet was excluded as having been fired from the barrel of the [#] pistol.
- The [#] cartridge case was excluded as having been fired in the [#] pistol.
- The [#] through [#] drill bits have a cutting diameter consistent with ¼ inch drill bits or larger and therefore were excluded as having created the toolmarks present on the [#] lock.
- The [#] and [#] PVC pipes were excluded as having been cut by the same tool.
- Bunter Marks - Due to many unknown variables in ammunition manufacturing and distribution, no conclusive determination could be made for whether the [Item #] cartridge cases originated from the same box of ammunition as the [Item #] cartridges. This result limits the number of ammunition boxes from which [Item #] could have originated. However, due to unknown variables in ammunition manufacturing and distribution, it cannot be conclusively determined to what degree this result limits the number of possible boxes of origin.
- Extrusion Marks - The Item [#] tubes/pipes bear manufacturing toolmarks along their length that are consistent with having been produced by an extrusion manufacturing method. These toolmarks were identified as having been produced by the same tool. This indicates that the Item [#] tubes/pipes share a common source. However, due to unknown variables in tube/pipe manufacturing, it cannot be determined whether the tubes/pipes were cut from one piece of stock or multiple pieces, and there is currently no known method to predict or determine how long these marks may persist during manufacture.
- Manufacturing Marks (mold marks) - The Item [#] and [#] [item description] bear manufacturing toolmarks that are consistent with having been produced by a mold. These toolmarks were identified as having been produced by the same tool. This indicates that the Item [#] and [#] share a common source. However, due to unknown variables in injection molding manufacturing, there is currently no known method to predict or determine how long these marks may persist during manufacture, or how many items may be produced from a mold.

Methods:

Toolmarks, whether they are present on evidence items or secondary evidence created in the Laboratory, undergo two stages of comparison. First, the class characteristics are reviewed and

compared. If the class characteristics of the toolmarks are not clearly different, the examination moves to a second stage using comparative microscopy.

A microscopic comparison examination consists of a search of the impressed and striated marks present in two toolmarks to determine if patterns of similarity exist. At the completion of these comparisons, one of the following three opinions is issued:

A. Source exclusion is an Examiner's conclusion that two toolmarks did not originate from the same source. This conclusion is an Examiner's opinion that the observed difference(s) in class characteristics provides extremely strong support for the proposition that the two toolmarks came from different sources and extremely weak or no support for the proposition that the two toolmarks came from the same source. A source exclusion based on a minor difference in measured class characteristics requires a verification.
B. Source identification is an Examiner's conclusion that two toolmarks originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source. The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks originated from the same source and extremely weak support for the proposition that the two toolmarks originated from different sources. A source identification requires a verification and is the Examiner's opinion that the probability that the two toolmarks were made by different sources is so small that it is negligible.
C. Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quantity of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks as having originated from the same source. This conclusion is an Examiner's opinion that there is an insufficient quality and/or quantity of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification, or a lack of any observed microscopic similarity.

Limitations:

Firearms/Toolmark Identification is an empirical science that relies on objective measurements and a subjective comparison of microscopic marks of value. Due to variation in substrate, changes in tool working surfaces from wear, corrosion, and damage, or the employment of unusual tool/work piece orientations, it may not be possible for an Examiner to reach a source conclusion. Additionally, some tool manufacturing methods routinely produce working surfaces that leave limited microscopic marks of value. Damaged, corroded, or fragmented items may be of little or no value for comparison purposes.

Virtual Comparison Microscopy - Virtual comparison microscopy (VCM) is restricted to the surface that a three-dimensional toolmark topographical instrument is capable of measuring to produce a digital reproduction. Additionally, individual characteristics may be present on the evidentiary item but may not be reproduced during a scan. This may be due to interference from lacquer/sealant, environmental damage, debris, or measuring limits for an instrument. Furthermore, physical characteristics that are not measurable, such as the metallic qualities of an item, may not be available for evaluation in the digital reproduction.

Bunter Mark Examination - Please note that no known method exists for accurately assessing the probability that these cartridges originated from the same box of ammunition.

3.14 Reference Ammunition File

Results:

- [#] is a .38 caliber/9mm full metal jacketed bullet fired from a barrel rifled with 8 lands and grooves, right twist. The weight and design characteristics of the [#] bullet are consistent with bullets typically loaded in .38 Special caliber cartridges, although other possibilities could not be eliminated. A search of the FBI Laboratory's Reference Ammunition File (RAF) located a sample with a bullet of similar weight and design. This .38 Special caliber ammunition is sold under the trade name Remington UMC and bears product code L38S11.

Methods:

The weight and design characteristics of submitted bullets are searched against the RAF database to determine possible manufacturer and trade name information.

Limitations:

The RAF database contains information obtained from ammunition purchased by the FBI Laboratory and is not a comprehensive representation of all types of ammunition present in the general public. Therefore, the results of RAF searches may not include the actual brand and type of ammunition represented by the questioned item.

3.15 Serial Number Restoration

Results:

- Examination and processing of the obliterated [area or serial number] on the [#] pistol restored the [area or serial number] to read “*702182.” The asterisk represents a character that was partially restored but could not be conclusively determined. The Bureau of Alcohol, Tobacco and Firearms Serial Number Structure Guide indicates that the first character on firearms like the [#] pistol is typically a “T”.
- The examination and processing of the obliterated serial number on the [#] pistol was partially restored to read “77?*182”. The question mark represents a character that could not be determined. The asterisk represents a number that was partially restored and is most likely a “2” or a “7”.

- The examination and processing of the obliterated serial number on the [#] pistol was restored to read “7702182”.
- The examination and processing of the obliterated serial number was unsuccessful in restoring the serial number on the [#] pistol.

Methods:

Magnetic, thermal, and chemical methods may be used for the restoration of serial numbers. Conclusions regarding restored characters are made by visual examination of the restored surface under a variety of lighting conditions. Information regarding the alpha-numeric structure or the general location of serial numbers is obtained when necessary from reference sources or from firearms in the Laboratory's Reference Firearms Collection.

Limitations:

Except for the magnetic method, serial number restoration is a destructive examination, and it is possible that the obtained results may not be reproduced in any subsequent examinations. Restored serial numbers are sometimes only visible during a portion of the reconstruction process and are not necessarily visible at the conclusion of the process.

3.16 Silencer/Suppressor

Results:

- [#] is a silencer (suppressor) with the design and components for diminishing the report of a firearm.
- [#] is a silencer (suppressor) with the design and components for diminishing the report of a firearm. The [#] silencer is threaded and will attach to the muzzle of the [#] pistol. When the [#] pistol was test fired in the Laboratory using the [#] silencer, an audible difference with and without the silencer was produced.
- [#] is a silencer (suppressor) with the design and components for diminishing the report of a firearm. The [#] silencer is threaded and will attach to the muzzle of the [#] pistol. Sound attenuation tests were conducted by firing the [#] pistol using the [#] silencer. An average sound reduction of approximately [number] decibels (+/- [0.00] dB, k=3 for a 99.73% confidence level) was measured using the [#] silencer with the [#] pistol.

Methods:

Silencers are visually inspected to determine if they can be classified as a silencer by design. Reference material is used to assist in this determination and the use of an X-ray machine allows for an internal inspection of a silencer.

(Quantitative Result) Sound attenuation tests are conducted using a decibel meter. The mean and the uncertainty (three standard deviations) are calculated after measuring a minimum of ten shots with and without the silencer.

Limitations:

Physical sound attenuation tests conducted in the FBI Laboratory are intended to determine if there was audible difference with and without the use of a silencer. These tests are not intended to quantify the reduction in sound.

(Quantitative Result) Sound attenuation tests conducted in the FBI Laboratory are not intended to measure an absolute value for sound reduction, but rather the measured difference with and without a silencer installed.

3.17 Tools

Results:

- [#] is a [brand/manufacturer] [type of tool], that uses a [insert type of action].
- [#] is a [brand/manufacturer] [type of tool].

Methods:

The type, action, and manufacturer of a tool are normally determined by directly observing the function and manufacturer markings on the tool in question. When these are not present, published materials and tool literature in the Firearms/Toolmarks Discipline reference library may be used to make determinations. When a microscopic comparison is necessary using a questioned tool, test samples are created using a test material that is softer or similar in quality to the item being compared.

Limitations:

The results of tool examinations describe the type and/or operating condition of the tool as it was received in the Firearms/Toolmarks Discipline.

3.18 Trajectory Examination

Results:

- Predicated on a request to the Laboratory Division from [name], a Laboratory Shooting Reconstruction Team (LSRT) was deployed to [location], on [date] to perform a Shooting Incident Reconstruction (SIR). The members of the LSRT were Physical Scientist/Forensic Examiner [name], Visual Information Specialist [name] of the Operational Projects Unit, and Supervisory Special Agent [name] of the Evidence Response Team Unit. These examinations were conducted on [date] at the [address].
- Graphical depictions of the results of SIR examinations have been prepared by the Laboratory Division's Operational Projects Unit and are included in this report.
- (Optional) For the purpose of this report [insert identifier] represents holes that were generated when a bullet and/or debris punctured an object. The letter [insert identifier] represents impacts that were generated when a bullet and/or debris struck an object.
- (Optional) For the purpose of this report the origin of a trajectory will be referred to by compass direction.

- (Optional) For the purpose of this report the origin of a trajectory will be referred to by vehicle quadrants.
- (Optional) Information regarding the locations of the vehicles at the shooting scene was provided to the Operational Projects Unit by [name] and was not determined through Laboratory examination.
- Five bullet trajectories were reconstructed, with two originating from the front-driver quadrant and three from the front-passenger quadrant. Four additional holes/impacts (three exterior, one interior) could not be associated with a specific trajectory.
- Four bullet trajectories were reconstructed, with all of them originating from the rear-driver quadrant. One additional hole in the windshield could not be associated with a specific trajectory but has damage consistent with the passage of a bullet from the inside of the vehicle to the outside.
- Two bullet trajectories were reconstructed on the exterior of Wrigley Field immediately adjacent to the left field bleachers above Waveland Avenue. These trajectories come from the direction of the seating area on the roof of the apartment building at 1049 Waveland Avenue. Three additional holes consistent with having been caused by a bullet were examined but were unsuitable for trajectory reconstruction or directional determinations.

Methods:

Trajectories can be determined by either measuring the (x,y,z) coordinates of at least two points along each trajectory, or by measuring the position of one hole/impact and taking horizontal angle (azimuth) and vertical angle (declension) measurements of the trajectory rods. Measurements are acquired through various equipment, some maintained by the Operational Projects Unit.

Vehicle Examinations - For manual measurements, a Cartesian coordinate system is established by using tape measures to create an x y dimension grid around the vehicle. A series of 3-D measurements (x,y,z) is recorded that establishes the vehicle's basic dimensions and its location within the grid. Points of interest (suspected bullet holes or impacts) on the exterior or in the interior of the vehicle are identified and labeled. These holes and impacts are examined to determine whether they have physical effects consistent with having been caused by a bullet. They are then examined to determine specific trajectories (holes caused by the same bullet) and to identify the direction the bullet was traveling. The direction of travel can be determined by the nature of the damage around the hole(s), the direction of transport of additional materials from a hole, the lack of an exit hole on one end of the trajectory, or by the recovery of a bullet or bullet fragments at one end of the trajectory. Holes and impacts of importance are labeled and measured from a position within the grid system. Manual measurements may be supplemented with or replaced by data from surveying equipment or laser scanning devices operated by the Operational Projects Unit.

Non-vehicle Examinations - Areas of interest for Shooting Incident Reconstruction are measured and/or surveyed and documented to allow for 3-D computer reconstruction of the shooting scene. Suspected bullet holes/impacts are examined to determine whether they have

physical effects consistent with having been caused by a bullet and/or debris. They are then examined to determine specific trajectories (holes caused by the same bullet) and to identify the direction the bullet was traveling. The direction of travel can be determined by the nature of the damage around the hole(s), the direction of transport of additional materials from a hole, the lack of an exit hole on one end of the trajectory, or by the recovery of a bullet or bullet fragments at one end of the trajectory. For manual measurements, coordinate systems are established within the shooting scene to allow for all holes/impacts of importance to be measured within the overall scene. Manual measurements may be supplemented with or replaced by data from surveying equipment or laser scanning devices operated by the Operational Projects Unit.

Limitations:

Due to vehicle glass breakage, bullet fragmentation, bullet deflection, intervening objects, mobile objects, and scene variants, trajectory determination may be unsuccessful. Consequently, the number of reconstructed trajectories may not indicate the total number of shots fired. Trajectory determination involving a wound and/or injury are outside the scope of the firearms/toolmarks discipline.

3.19 Administrative Section (Follow Up and Introduction Sentences)

- Follow Up Report - This report is a follow-up to an FBI Laboratory Report [Laboratory #] dated [date]. The results of the [examination type] examination[s] are included in this report.
- Introduction Sentences
    - The results of the [type] examinations are included in this report.
    - The results of the [type] examinations and national database searches are included in this report.
- Listing Combined Report - The items listed below were submitted under cover of communication dated [date] in FBI Case ID [ ] and assigned Laboratory number [#]:

3.20 Remarks Section (Defensive Systems Unit and Discontinuation)

- Defense Systems Unit Assisted Examinations
    - The requested [examination] of the [#] [pistol] cannot be performed at the FBI Laboratory due to a lack of the appropriate expertise and equipment. Arrangements have been made to have this test performed by the Defensive Systems Unit of the FBI Training Division. Any questions about this test or requests for testimony regarding the results of this test should be directed to Defensive Systems Unit personnel, [phone number].
    - To facilitate the requested [examination], the [Item #] was test fired at the Ballistic Research Facility of Defensive Systems Unit, Training Division. The [Item #] was fired using the attached [list accessories] provided by the Ballistic Research Facility. The shooting was performed by [name] of the Ballistic Research Facility, who can be contacted for information about the results of these tests or for any further shooting accuracy requests.

- Discontinued Examination/Request
    - Per communication with [title] [name] on [date], the [type] examinations were discontinued and the Item [#] will not be examined at the FBI Laboratory.
    - Per email communication between [name] and [title] [name] on [date], the request for [type] examination has been discontinued.

4 REFERENCES

United States. Department of Justice. Office of Legal Policy. Forensic Science. (2020, August) Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Fracture Examination. Retrieved from the Department of Justice Web site: https://www.justice.gov/olp/page/file/1284761/download

United States. Department of Justice. Office of Legal Policy. Forensic Science. (2020, August) Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Pattern Examination. Retrieved from the Department of Justice Web site: https://www.justice.gov/olp/page/file/1284766/download

5 REVISION HISTORY

Revision	Issue Date	Changes
00	02/18/2022	Original issuance of document. Transferred the Results Language, Methods, and Limitations from FTD-113-01 Appendix A. Updated clause that accompanies inconclusive statement for fracture and pattern comparisons.